

# Distributed Multi-agent Fault Diagnosis and Reconfiguration Control, Phase I

Completed Technology Project (2007 - 2008)



## Project Introduction

In order to meet the challenges of long-duration space exploration (e.g., missions to the Moon, Mars and beyond), onboard real-time health management of spacecraft that responds rapidly to system and subsystem events is essential. In response to this need, Qualtech Systems, Inc. (QSI), in cooperation with Vanderbilt University, proposes to develop a distributed multi-agent fault diagnosis and reconfiguration control (FDR) approach for addressing the health management problem. The proposed solution uses "intelligent" schemes to coordinate local health assessments of multiple interconnected subsystems ("local diagnosers") to a convergent and correct global system health assessment. In addition, the solution recommends relevant system recovery functions based on fault isolation information and fault severity estimates. Design of local diagnosers for subsystem health assessment utilizes a combination of both model-based and data-driven diagnostic methods in an integrated development environment for accurate root cause isolation.

## Anticipated Benefits

Potential NASA Commercial Applications: The proposed technology will have wide applications beyond NASA. Such complex systems as commercial and military aircraft, ground transportation, communications systems, power generation systems, etc., could all benefit tremendously from the proposed technology. The proposed solution offers a distributed fault diagnosis and reconfiguration control and an integrated develop environment that can provide designing and evaluating diagnostic systems for these distributed networked systems. The integrated solution will also significantly shorten the proto-type design cycle for commercial diagnostic systems.



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## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

### Lead Center / Facility:

Ames Research Center (ARC)

### Responsible Program:

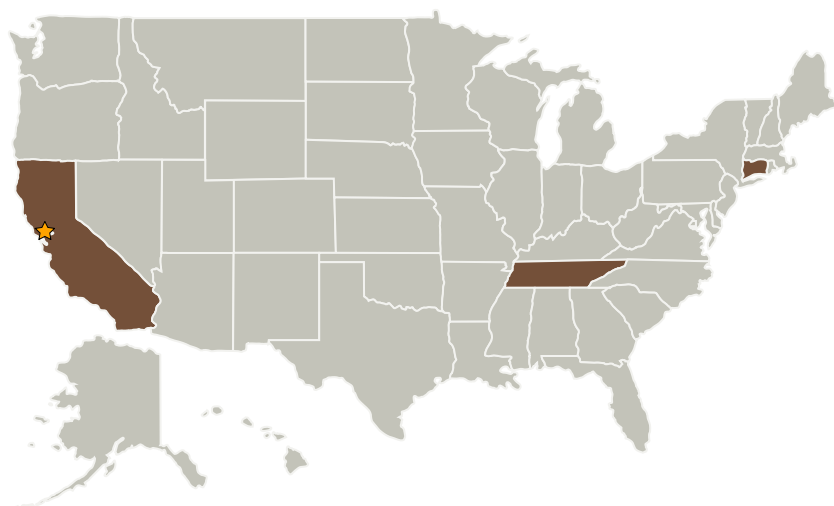
Small Business Innovation Research/Small Business Tech Transfer

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## Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★ Ames Research Center(ARC)	Lead Organization	NASA Center	Moffett Field, California
Qualtech Systems, Inc.	Supporting Organization	Industry Minority-Owned Business, Small Disadvantaged Business (SDB)	Rocky Hill, Connecticut
Vanderbilt University	Supporting Organization	Academia	Nashville, Tennessee

## Primary U.S. Work Locations

California	Connecticut
Tennessee	

## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

Carlos Torrez

**Project Manager:**

David E Thompson

**Principal Investigator:**

Sudipto Ghoshal

## Technology Areas

**Primary:**

- TX10 Autonomous Systems
  - └ TX10.2 Reasoning and Acting
  - └ TX10.2.5 Fault Diagnosis and Prognosis

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## Project Transitions



**January 2007:** Project Start



**January 2008:** Closed out

**Closeout Summary:** Distributed Multi-agent Fault Diagnosis and Reconfiguration Control, Phase I Project Image